



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$\Sigma mxy = \rho \sin^2 \beta \int_{-1/2a}^{1/2a} \int_{-1/2b}^{1/2b} (x + y \cos \beta) y dx dy = \frac{1}{24} m b^2 \sin 2\beta.$$

$$\therefore \tan 2\theta = \frac{b^2 \sin 2\beta}{a^2 + b^2 (\cos^2 \beta - \sin^2 \beta)} = \frac{b^2 \sin 2\beta}{a^2 + b^2 \cos 2\beta}.$$

Let A, B be the principal moments.

$$\therefore A \cos^2 \theta + B \sin^2 \theta = \frac{1}{2} m (a^2 + b^2 \cos^2 \beta) \dots \dots (1).$$

$$A \sin^2 \theta + B \cos^2 \theta = \frac{1}{2} m b^2 \sin^2 \beta \dots \dots (2).$$

$$(1) + (2) \text{ gives } A + B = \frac{1}{2} m (a^2 + b^2).$$

$$(1) - (2) \text{ gives } A - B = \frac{1}{2} m (a^2 + b^2 \cos 2\beta) \sec 2\theta$$

$$= \frac{1}{2} m \sqrt{a^4 + b^4 + 2a^2 b^2 \cos 2\beta}.$$

$$\therefore A = \frac{1}{4} m [a^2 + b^2 + \sqrt{a^4 + b^4 + 2a^2 b^2 \cos 2\beta}].$$

$$B = \frac{1}{4} m [a^2 + b^2 - \sqrt{a^4 + b^4 + 2a^2 b^2 \cos 2\beta}].$$

DIOPHANTINE ANALYSIS.

76. Proposed by G. B. M. ZERR, A. M., Ph. D., Professor of Mathematics and Science, Chester High School, Chester, Pa.

It is required to find four positive numbers such that if each be diminished by twice the cube of their sum the four remainders will be rational cubes.

Solution by the PROPOSER.

Let u, v, x, y be the numbers.

Then $u - 2(u + v + x + y)^3 = a^3 / h^3 (x + y + u + v)^3$, suppose.

$v - 2(u + v + x + y)^3 = b^3 / h^3 (x + y + u + v)^3$, suppose.

$x - 2(u + v + x + y)^3 = c^3 / h^3 (x + y + u + v)^3$, suppose.

$y - 2(u + v + x + y)^3 = d^3 / h^3 (x + y + u + v)^3$, suppose.

Adding we get

$$u + v + x + y - 8(u + v + x + y)^3 = \frac{a^3 + b^3 + c^3 + d^3}{h^3} (u + v + x + y)^3.$$

$$\text{Let } a^3 + b^3 + c^3 + d^3 = h^3.$$

$$\therefore u + v + x + y = 9(u + v + x + y)^3. \quad \therefore u + v + x + y = \frac{1}{9}.$$

$$\therefore u = \frac{a^3 + 2h^3}{27h^3}, \quad v = \frac{b^3 + 2h^3}{27h^3}, \quad x = \frac{c^3 + 2h^3}{27h^3}, \quad y = \frac{d^3 + 2h^3}{27h^3}.$$

$$\text{Let } a=1, b=5, c=7, d=12, h=13.$$

$$\therefore u = \frac{4395}{59319}, v = \frac{4519}{59319}, x = \frac{4737}{59319}, y = \frac{6182}{59319}.$$

Let $a=4$, $b=7$, $c=8$, $d=17$, $h=18$.

$$\therefore u = \frac{11728}{157464}, v = \frac{12007}{157464}, x = \frac{12176}{157464}, y = \frac{16577}{157464}.$$

Other values can be found for u , v , x , y .

77. Proposed by JOHN M. COLAW, A. M., Monterey, Va.

Find (1) three consecutive numbers whose sum is a cube, and (2) three consecutive numbers the sum of whose cubes is a cube.

Solution by M. A. GRUBER, A. M., War Department, Washington, D. C.

(1). Let $n-1$, n , and $n+1$ be any three consecutive numbers.

Then $(n-1)+n+(n+1)=3n=a \text{ cube}=27m^3$.

Whence $n=9m^3$.

$\therefore 9m^3-1$, $9m^3$, and $9m^3+1$ are the general expressions for three consecutive numbers whose sum is a cube.

Take $m=1$; then $8+9+10=27=3^3$.

Take $m=2$; then $71+72+73=216=6^3$; etc.

(2). $(n-1)^3+n^3+(n+1)^3=3n^3+6n=a \text{ cube}=27m^3$.

Whence $n^3+2n=9m^3$.

Put $m=an$; then $n^3+2n=9a^3n^3$.

Whence $n^2+2=9a^3n^2$; and $n^2=2/(9a^3-1)$.

To obtain n integral, a must be fractional.

Put $a=1/b$; then $n^2=2b^3/(9-b^3)$.

To avoid imaginary results, $b < 2\frac{1}{2}$.

The only integral values that can be assigned to b are 1 and 2.

Take $b=1$; then $n=\frac{1}{2}$.

Whence $(-\frac{1}{2})^3+(\frac{1}{2})^3+(\frac{3}{2})^3=(\frac{3}{2})^3$.

Take $b=2$; then $n=4$.

Whence $3^3+4^3+5^3=6^3$.

This is the only set of three consecutive integers the sum of whose cubes is a cube.

Fractional values of b give fractional values for n .

When $b=0$, $n=0$.

Whence $(-1)^3+0^3+1^3=0^3$.

Also solved by CHARLES C. CROSS, JOSIAH H. DRUMMOND, ALOIS F. KOVARIK, NELSON L. RORAY, J. SCHEFFER, ELMER SCHUYLER, and G. B. M. ZERR.

AVERAGE AND PROBABILITY.

81. Proposed by LON C. WALKER, Assistant in Mathematics, Leland Stanford, Jr., University, Palo Alto, Cal.

Find (1) the mean distance of all points on a side of an equilateral triangle from the opposite vertex; and (2), the average length of a line drawn at random across an equilateral triangle.